



## SEMITRANS® 6

### IGBT Modules

#### SKM25GAH125D

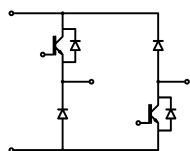
##### Target Data

##### Features

- $V_{CE(sat)}$  with positive temperature coefficient
- High short circuit capability, self limiting to  $6 \times I_{Cnom}$
- Fast & soft inverse CAL diodes
- Large clearance (10 mm) and creepage distances (20 mm)
- Isolated copper baseplate using DBC Technology (Direct Copper Bonding)
- UL recognized, file no. E63532

##### Typical Applications\*

- DC/DC – converter
- Brake chopper
- Switched reluctance motor
- DC – motor



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Absolute Maximum Ratings				
Symbol	Conditions		Values	Unit
<b>IGBT</b>				
$V_{CES}$	$T_j = 25\text{ °C}$		1200	V
$I_C$	$T_j = 150\text{ °C}$	$T_c = 25\text{ °C}$	39	A
		$T_c = 80\text{ °C}$	27	A
$I_{Cnom}$			25	A
$I_{CRM}$	$I_{CRM} = 2 \times I_{Cnom}$		50	A
$V_{GES}$			-20 ... 20	V
$t_{psc}$	$V_{CC} = 600\text{ V}$	$T_j = 125\text{ °C}$	10	$\mu\text{s}$
	$V_{GE} \leq 15\text{ V}$			
	$V_{CES} \leq 1200\text{ V}$			
$T_j$			-55 ... 150	$^{\circ}\text{C}$
<b>Inverse diode</b>				
$I_F$	$T_j = 150\text{ °C}$	$T_c = 25\text{ °C}$	47	A
		$T_c = 80\text{ °C}$	32	A
$I_{Fnom}$			40	A
$I_{FRM}$	$I_{FRM} = 2 \times I_{Fnom}$		80	A
$I_{FSM}$	$t_p = 10\text{ ms, sin } 180^{\circ}, T_j = 25\text{ °C}$		410	A
$T_j$			-40 ... 150	$^{\circ}\text{C}$
<b>Freewheeling diode</b>				
$I_F$	$T_j = 150\text{ °C}$	$T_c = 25\text{ °C}$	47	A
		$T_c = 80\text{ °C}$	32	A
$I_{Fnom}$			40	A
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$I_{FSM}$	$t_p = 10\text{ ms, sin } 180^{\circ}, T_j = 25\text{ °C}$		410	A
$T_j$			-40 ... 150	$^{\circ}\text{C}$
<b>Module</b>				
$I_{t(RMS)}$	$T_{terminal} = 80\text{ °C}$		100	A
$T_{stg}$			-40 ... 125	$^{\circ}\text{C}$
$V_{isol}$	AC sinus 50 Hz, $t = 1\text{ min}$		4000	V

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
<b>IGBT</b>						
$V_{CE(sat)}$	$I_C = 25\text{ A}$ $V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25\text{ °C}$	3.20	3.70		V
		$T_j = 125\text{ °C}$	3.60	4.20		V
$V_{CE0}$	chipelevel	$T_j = 25\text{ °C}$	1.5	1.75		V
		$T_j = 125\text{ °C}$	1.7	1.95		V
$r_{CE}$	$V_{GE} = 15\text{ V}$ chipelevel	$T_j = 25\text{ °C}$	68.00	78.00		$\text{m}\Omega$
		$T_j = 125\text{ °C}$	76.00	90.00		$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 1\text{ mA}$		4.5	5.5	6.5	V
$I_{CES}$	$V_{GE} = 0\text{ V}$ $V_{CE} = 1200\text{ V}$	$T_j = 25\text{ °C}$	0.1	0.3		mA
						mA
$C_{ies}$	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$	1.65			nF
$C_{oes}$		$f = 1\text{ MHz}$	0.25			nF
$C_{res}$		$f = 1\text{ MHz}$	0.11			nF
$Q_G$	$V_{GE} = -8\text{ V...} + 20\text{ V}$		221			nC
$R_{Gint}$	$T_j = 25\text{ °C}$		0.00			$\Omega$



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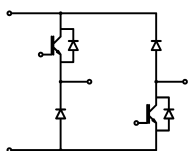
##### Features

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- High short circuit capability, self limiting to  $6 \times I_{cnom}$
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##### Typical Applications\*

- DC/DC – converter
- Brake chopper
- Switched reluctance motor
- DC – motor

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
$t_{d(on)}$	$V_{CC} = 600\text{ V}$	$T_j = 125\text{ °C}$		25		ns
$t_r$	$I_C = 25\text{ A}$	$T_j = 125\text{ °C}$		19		ns
$E_{on}$	$V_{GE} = \pm 15\text{ V}$	$T_j = 125\text{ °C}$		3.9		mJ
$t_{d(off)}$	$R_{G\ on} = 16\ \Omega$	$T_j = 125\text{ °C}$		184		ns
$t_f$	$R_{G\ off} = 16\ \Omega$	$T_j = 125\text{ °C}$		8		ns
$E_{off}$		$T_j = 125\text{ °C}$		1.6		mJ
$R_{th(j-c)}$	per IGBT				0.56	K/W
Inverse diode						
$V_F = V_{EC}$	$I_F = 40\text{ A}$	$T_j = 25\text{ °C}$		2.13	2.65	V
	$V_{GE} = 0\text{ V}$	$T_j = 125\text{ °C}$		1.94	2.46	V
$V_{F0}$	chiplevel	$T_j = 25\text{ °C}$		1.1	1.45	V
		$T_j = 125\text{ °C}$		0.85	1.2	V
$r_F$	chiplevel	$T_j = 25\text{ °C}$		25.7	30.0	m $\Omega$
		$T_j = 125\text{ °C}$		27.1	31.4	m $\Omega$
$I_{RRM}$	$I_F = 25\text{ A}$	$T_j = 125\text{ °C}$				A
$Q_{rr}$		$T_j = 125\text{ °C}$				$\mu\text{C}$
$E_{rr}$	$V_{GE} = \pm 15\text{ V}$	$T_j = 125\text{ °C}$				mJ
	$V_{CC} = 600\text{ V}$	$T_j = 125\text{ °C}$				
$R_{th(j-c)}$	per diode				1	K/W
Freewheeling diode						
$V_F = V_{EC}$	$I_F = 40\text{ A}$	$T_j = 25\text{ °C}$		2.00	2.5	V
	$V_{GE} = 0\text{ V}$	$T_j = 125\text{ °C}$		1.8	2.3	V
$V_{F0}$	chiplevel	$T_j = 25\text{ °C}$		1.1	1.45	V
		$T_j = 125\text{ °C}$		1.18	1.2	V
$r_F$	chiplevel	$T_j = 25\text{ °C}$		22.5	30.0	m $\Omega$
		$T_j = 125\text{ °C}$		27.1	31.4	m $\Omega$
$I_{RRM}$	$I_F = 25\text{ A}$	$T_j = 125\text{ °C}$		50		A
$Q_{rr}$	$di/dt_{off} = 2500\text{ A}/\mu\text{s}$	$T_j = 125\text{ °C}$		4		$\mu\text{C}$
$E_{rr}$	$V_{GE} = \pm 15\text{ V}$	$T_j = 125\text{ °C}$		1.1		mJ
	$V_{CC} = 600\text{ V}$	$T_j = 125\text{ °C}$				
$R_{th(j-c)}$	per Diode				1	K/W
Module						
$L_{CE}$					60	nH
$R_{CC+EE}$	terminal-chip	$T_C = 25\text{ °C}$				m $\Omega$
		$T_C = 125\text{ °C}$				m $\Omega$
$R_{th(c-s)}$	per module				0.05	K/W
$M_s$	to heat sink M6		4		5	Nm
$M_t$						Nm
						Nm
w					175	g



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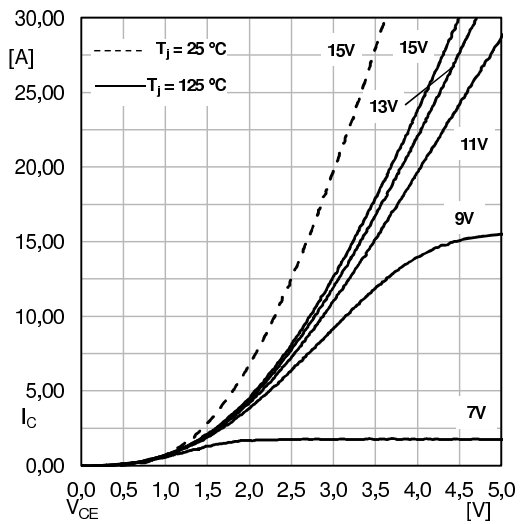


Fig. 1: Typ. output characteristic, inclusive  $R_{CC+EE}$

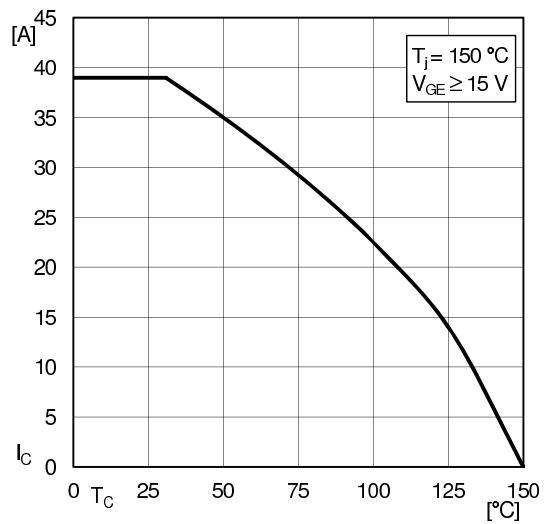


Fig. 2: Rated current vs. temperature  $I_C = f(T_C)$

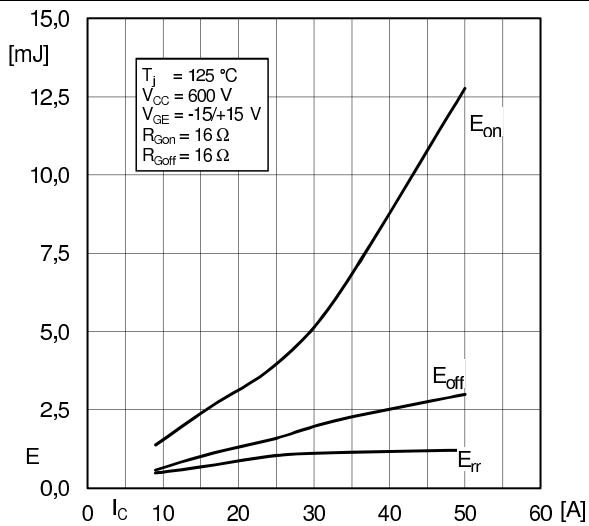


Fig. 3: Typ. turn-on /-off energy =  $f(I_C)$

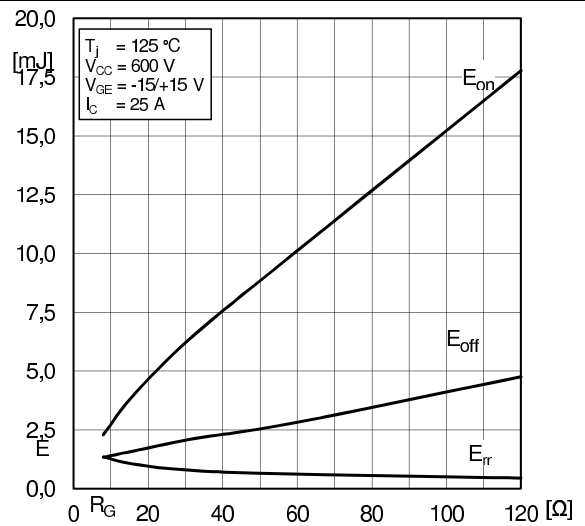


Fig. 4: Typ. turn-on /-off energy =  $f(R_G)$

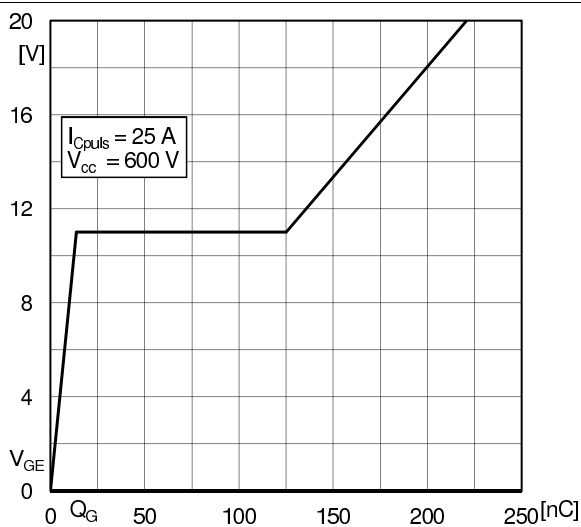


Fig. 6: Typ. gate charge characteristic

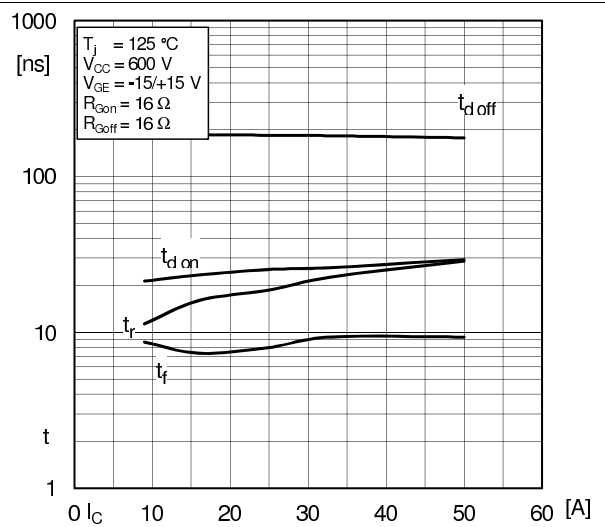


Fig. 7: Typ. switching times vs.  $I_C$

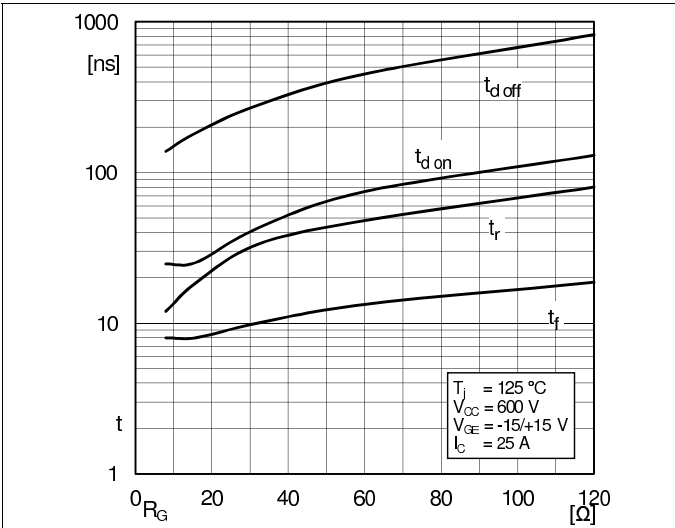


Fig. 8: Typ. switching times vs. gate resistor  $R_G$

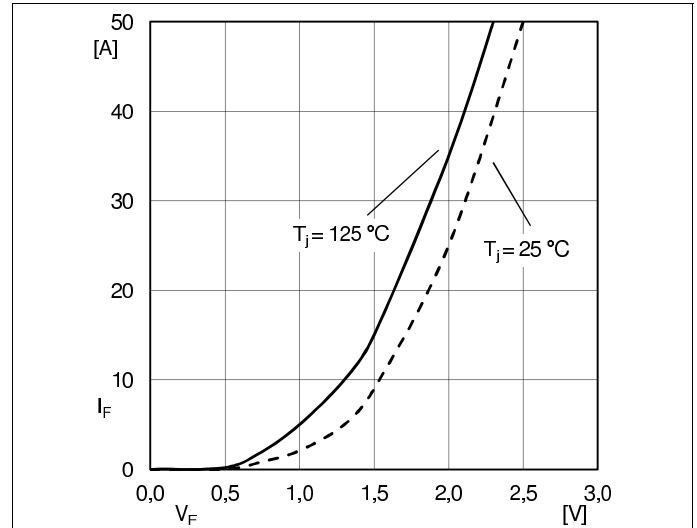
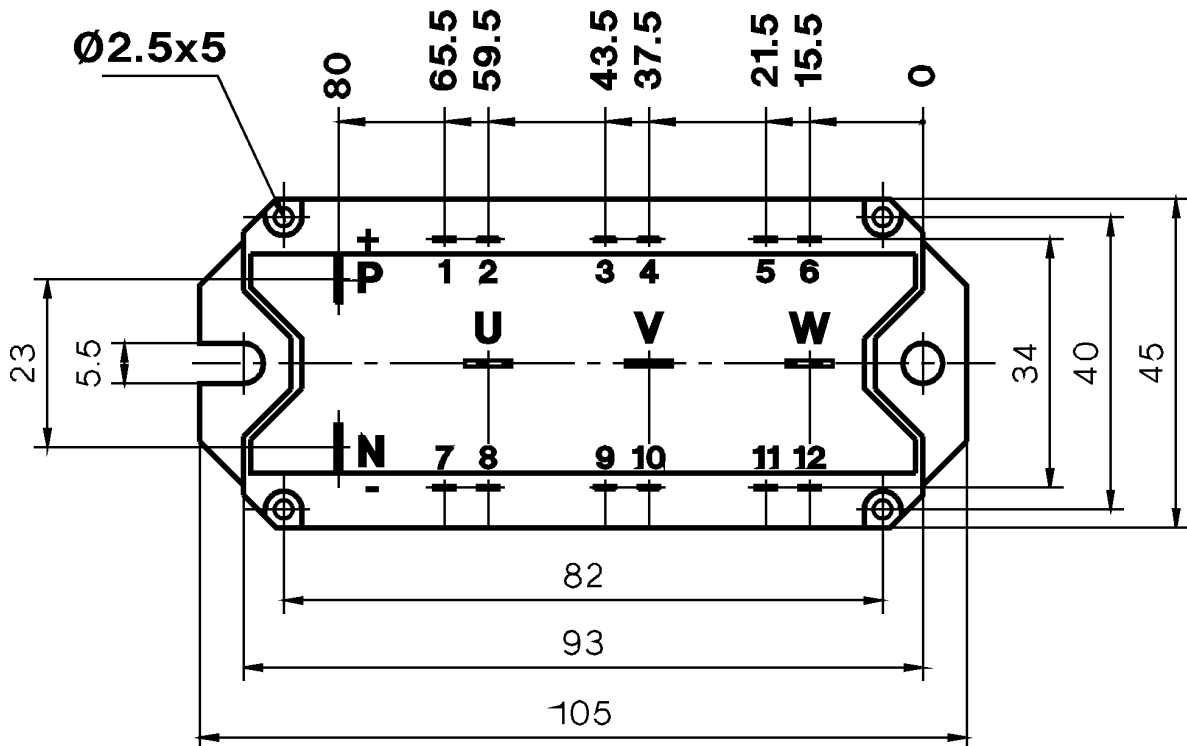
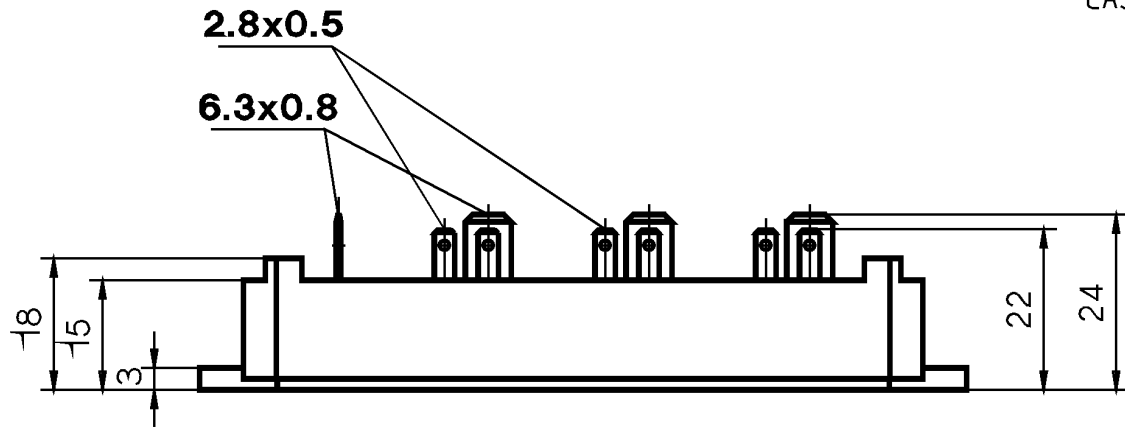
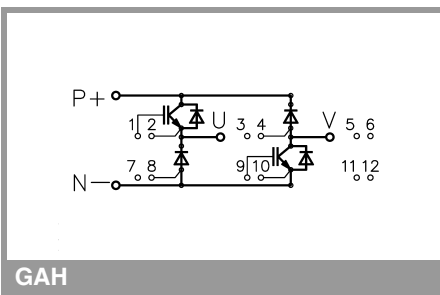


Fig. 10: Typ. CAL diode forward charact., incl.  $R_{CC'+EE'}$



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This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX

\* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our staff.